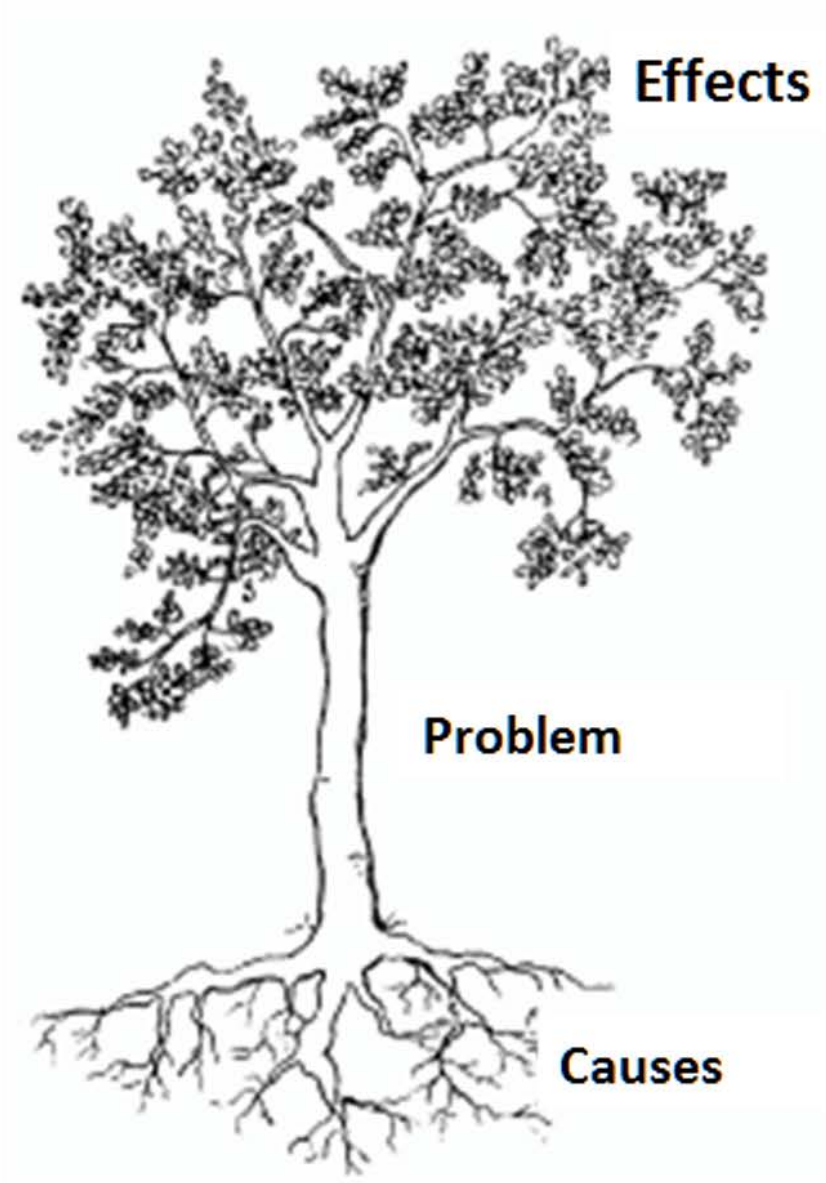
Analysis, Synthesis, Design of Solutions

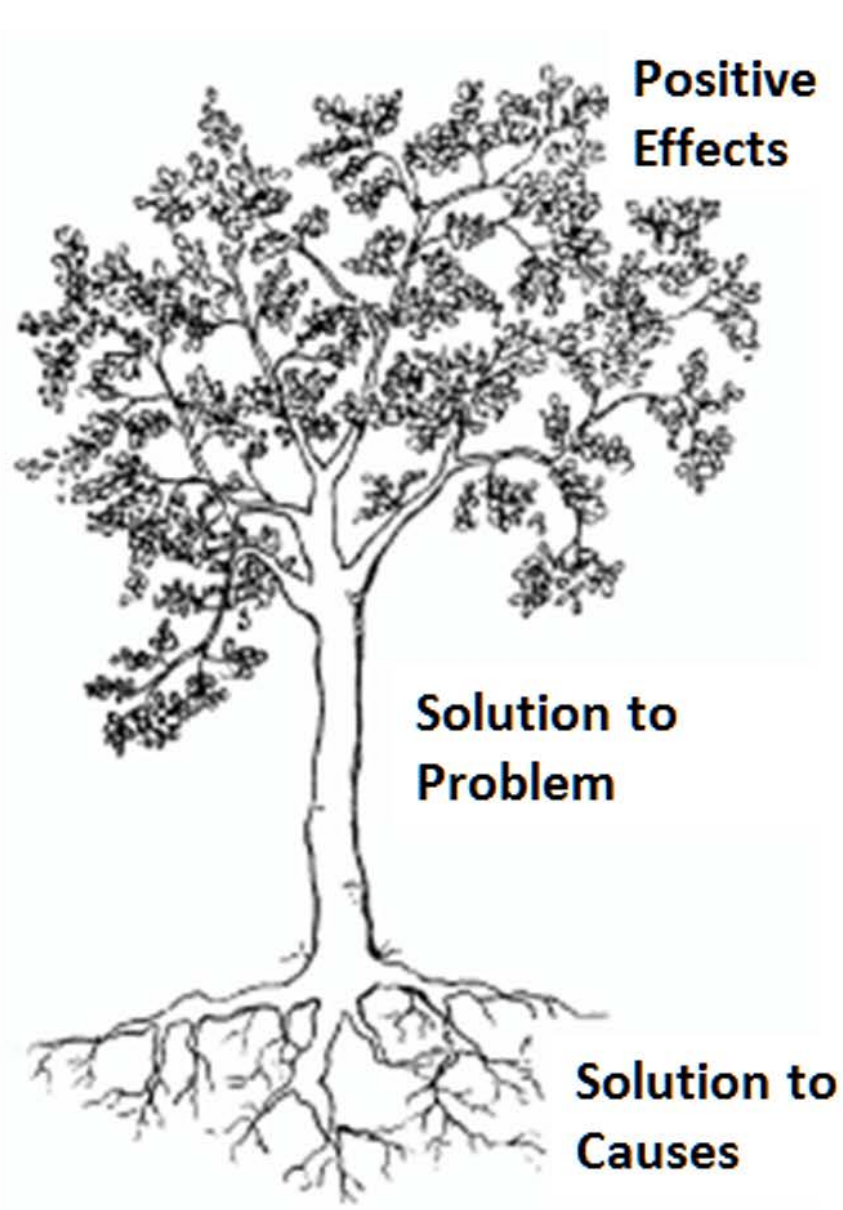
Identification and prioritization of problems, Problem Statement
Systems Perspective
- Preliminary Design and Work Plan -

Analysis

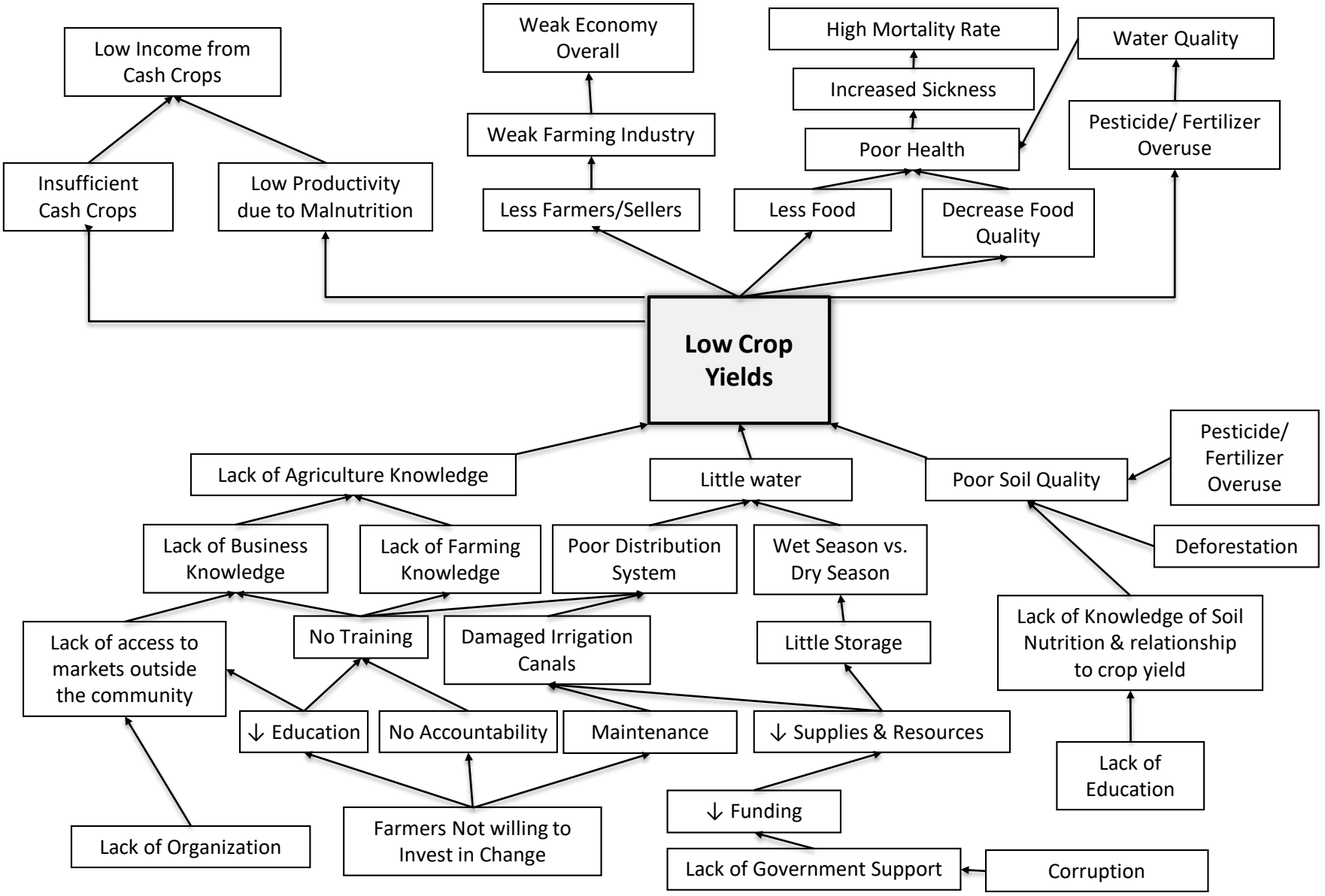
- Systematic identification and prioritization of problems. Use causal analysis (problem tree and solution tree): cause and effect relationships
- Planning of solutions: Use Action ID matrix; potential partner matrix; multiple criteria assessment matrix

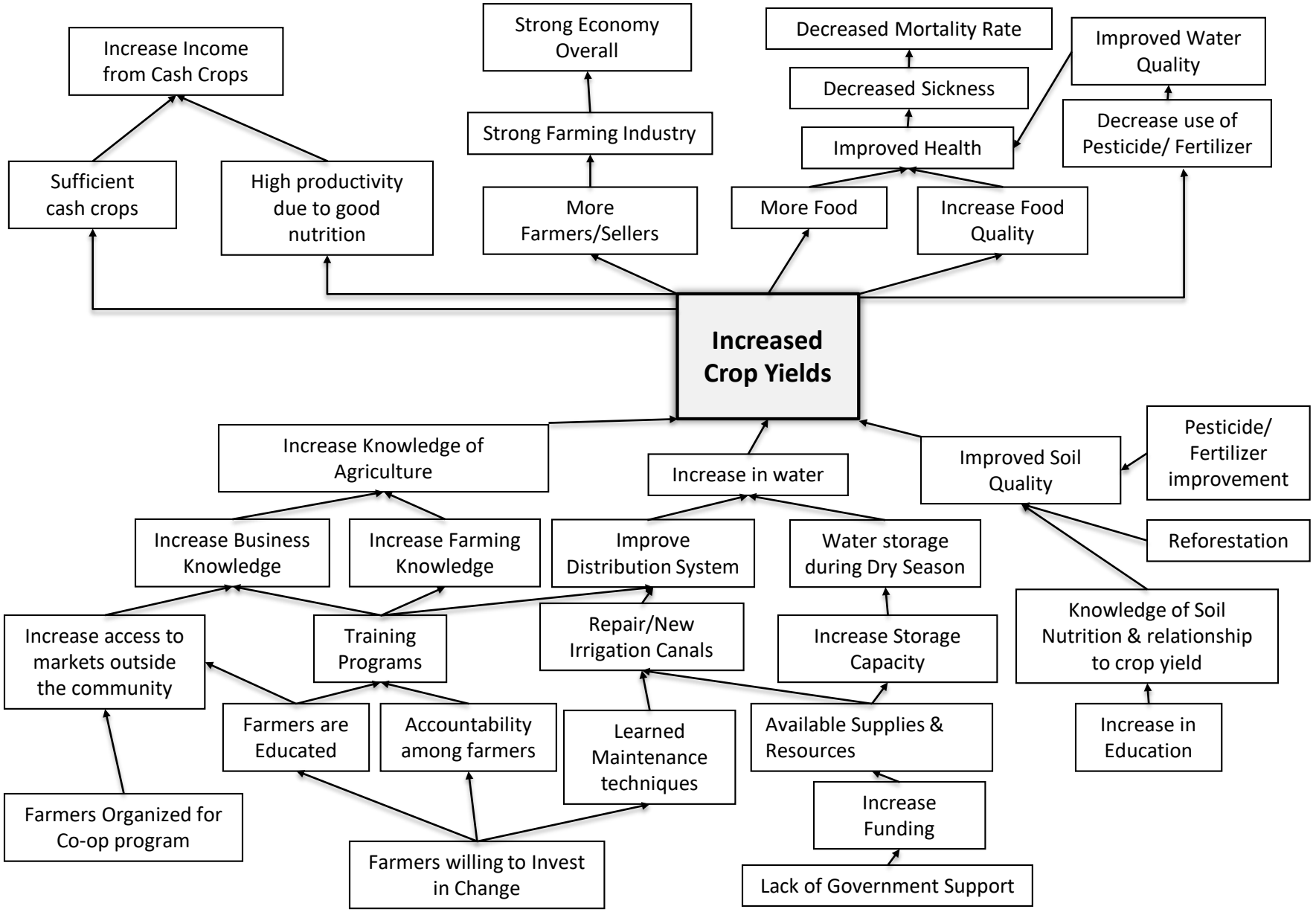

Effects
Problem
Causes

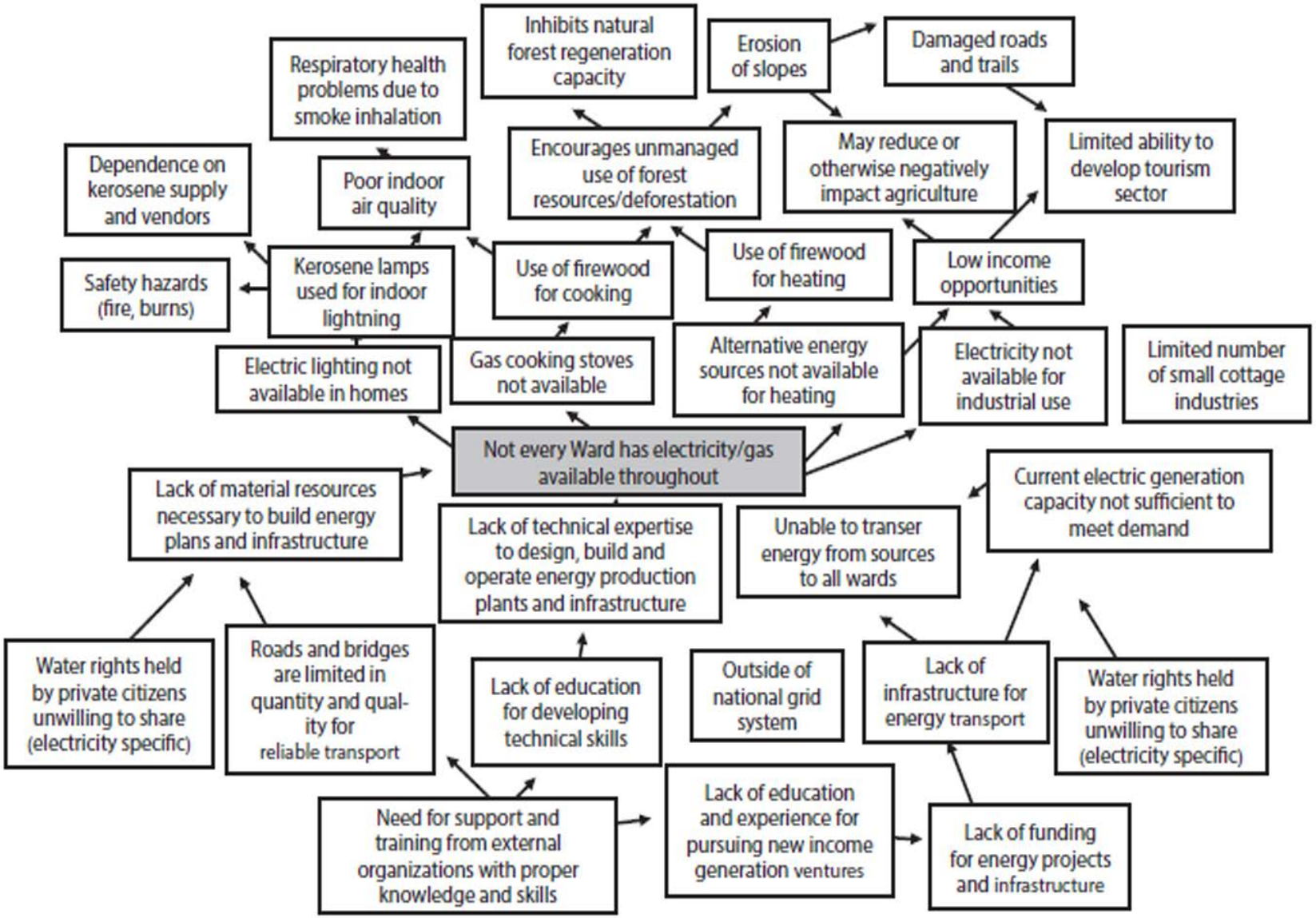
(a)

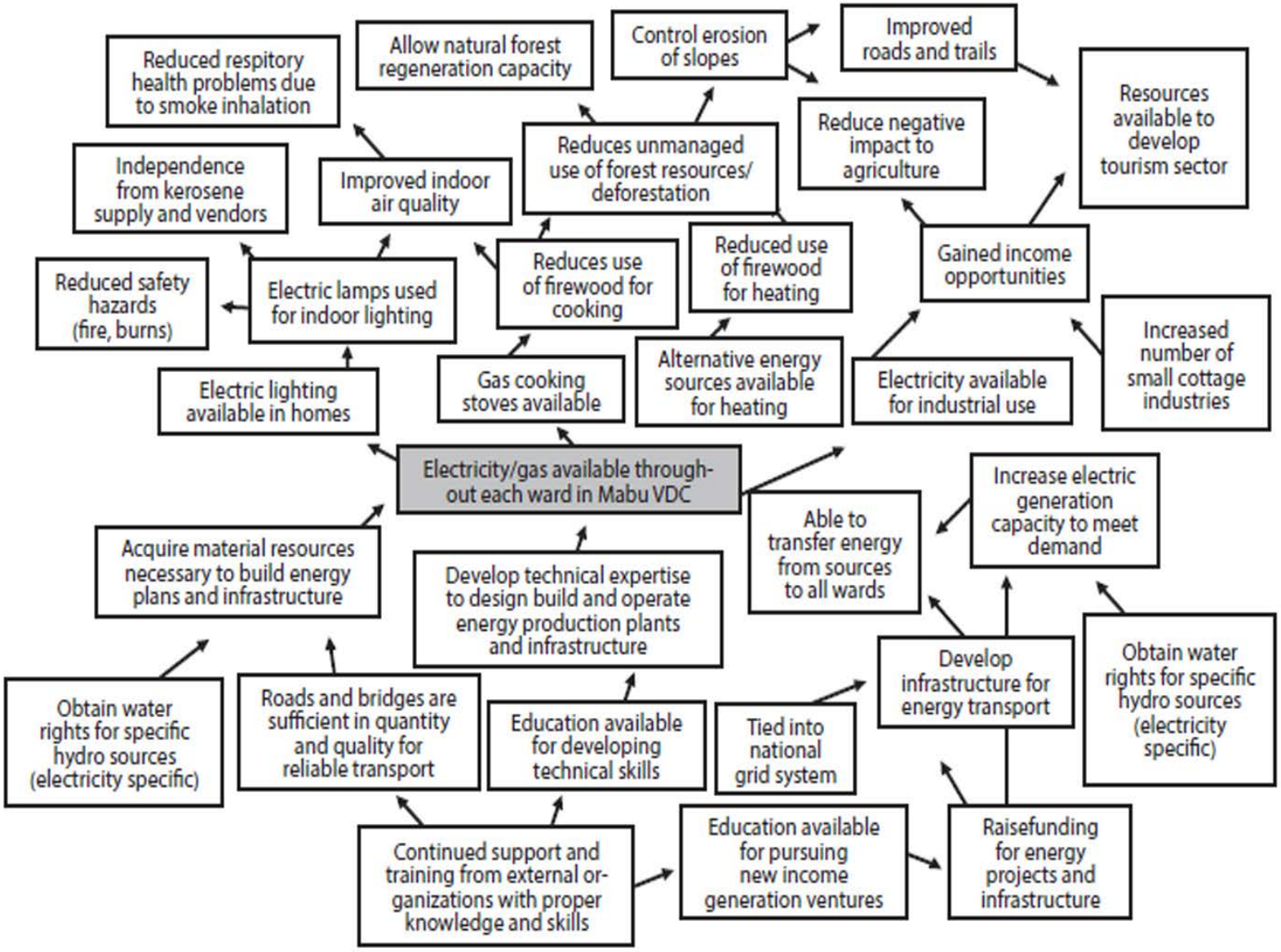

Positive
Effects
Solution to
Problem
Solution to
Causes

(b)


Low Income from Cash Crops
Weak Economy Overall
High Mortality Rate
Water Quality
Increased Sickness
Weak Farming Industry
Pesticide/ Fertilizer Overuse
Poor Health
Insufficient Cash Crops
Low Productivity due to Malnutrition
Less Farmers/Sellers
Less Food
Decrease Food Quality
Low Crop Yields
Pesticide/ Fertilizer Overuse
Lack of Agriculture Knowledge
Little water
Poor Soil Quality
Lack of Business Knowledge
Lack of Farming Knowledge
Poor Distribution System
Wet Season vs. Dry Season
Deforestation
Lack of access to markets outside the community
No Training
Damaged Irrigation Canals
Little Storage
Lack of Knowledge of Soil Nutrition & relationship to crop yield
↓ Education
No Accountability
Maintenance
↓ Supplies & Resources
Lack of Education
Lack of Organization
Farmers Not willing to Invest in Change
↓ Funding
Lack of Government Support
Corruption


Increase Income from Cash Crops
Strong Economy Overall
Decreased Mortality Rate
Improved Water Quality
Decreased Sickness
Strong Farming Industry
Decrease use of Pesticide/ Fertilizer
Improved Health
Sufficient cash crops
High productivity due to good nutrition
More Farmers/Sellers
More Food
Increase Food Quality
Increased Crop Yields
Increase Knowledge of Agriculture
Increase in water
Improved Soil Quality
Pesticide/ Fertilizer improvement
Increase Business Knowledge
Increase Farming Knowledge
Improve Distribution System
Water storage during Dry Season
Reforestation
Increase access to markets outside the community
Training Programs
Repair/New Irrigation Canals
Increase Storage Capacity
Knowledge of Soil Nutrition & relationship to crop yield
Farmers are Educated
Accountability among farmers
Learned Maintenance techniques
Available Supplies & Resources
Increase in Education
Farmers Organized for Co-op program
Increase Funding
Farmers willing to Invest in Change
Lack of Government Support


Inhibits natural forest regeneration capacity
Erosion of slopes
Damaged roads and trails
Respiratory health problems due to smoke inhalation
Encourages unmanaged use of forest resources/deforestation
May reduce or otherwise negatively impact agriculture
Limited ability to develop tourism sector
Dependence on kerosene supply and vendors
Poor indoor air quality
Use of firewood for heating
Low income opportunities
Safety hazards (fire, burns)
Kerosene lamps used for indoor lightning
Use of firewood for cooking
Alternative energy sources not available for heating
Electricity not available for industrial use
Limited number of small cottage industries
Electric lighting not available in homes
Gas cooking stoves not available
Not every Ward has electricity/gas available throughout
Lack of material resources necessary to build energy plans and infrastructure
Lack of technical expertise to design, build and operate energy production plants and infrastructure
Unable to transer energy from sources to all wards
Current electric generation capacity not sufficient to meet demand
Water rights held by private citizens unwilling to share (electricity specific)
Roads and bridges are limited in quantity and quality for reliable transport
Lack of education for developing technical skills
Outside of national grid system
Lack of infrastructure for energy transport
Water rights held by private citizens unwilling to share (electricity specific)
Need for support and training from external organizations with proper knowledge and skills
Lack of education and experience for pursuing new income generation ventures
Lack of funding for energy projects and infrastructure


Reduced respitory health problems due to smoke inhalation
Allow natural forest regeneration capacity
Control erosion of slopes
Improved roads and trails
Resources available to develop tourism sector
Independence from kerosene supply and vendors
Improved indoor air quality
Reduces unmanaged use of forest resources/ deforestation
Reduce negative impact to agriculture
Reduced safety hazards (fire, burns)
Electric lamps used for indoor lighting
Reduces use of firewood for cooking
Reduced use of firewood for heating
Gained income opportunities
Increased number of small cottage industries
Electric lighting available in homes
Gas cooking stoves available
Alternative energy sources available for heating
Electricity available for industrial use
Electricity/gas available through-out each ward in Mabu VDC
Able to transfer energy from sources to all wards
Increase electric generation capacity to meet demand
Acquire material resources necessary to build energy plans and infrastructure
Develop technical expertise to design build and operate energy production plants and infrastructure
Develop infrastructure for energy transport
Obtain water rights for specific hydro sources (electricity specific)
Obtain water rights for specific hydro sources (electricity specific)
Roads and bridges are sufficient in quantity and quality for reliable transport
Education available for developing technical skills
Tied into national grid system
Continued support and training from external or-ganizations with proper knowledge and skills
Education available for pursuing new income generation ventures
Raisefunding for energy projects and infrastructure

Key Root Causes and Effects

Need to:

- show good potential to make a significant impact and contribution if eliminated;
- make sense to community stakeholders;
- have major impact through synergy, collaboration, and partnering; and
- be achievable and measurable with the existing skills and resources of locals and outsiders.

Action ID matrix

Problems (effects and causes to tackle)	Solutions (objectives)	Potential actions (outputs)
Not enough water reaching crops (cause)	Provide water for crops during dry season	• Construct new irrigation canals • Train maintenance people to repair old, danaged canals • Implement drip irrigiation systems • Construct water storage facilities to provide water during dry season
Limited access to markets (cause)	Increased access to markets	• Implement greenhouse farming system to allow off-season crop growth • Switch to herbal intensive farming • Educational campaign for co-op program
Deforestation leading to erosion (cause)	Reforestation	• Implement forestry management system (controlled harvesting and replanting) • Education campaign on importance of forests • Plant trees at field boundaries to create buffer zones for erosion control and wildlife habitat • Implement forest intgration farming to reduce deforesta-tion for expansion of agriculture
Poor soil quality (cause)	Improve soil quality	• Switch to crops more suited to environment • Implement organic farming methods • Provide education about sustainable agricultural methods • Begin program to use animal and plant waste in place of chemical fertilizers • Implement soil erosion control systems

MCUA Matrix

		Train maintenance person for old canals		Irrigation canals		Implement drip irrigation		Water storage facilities for year round water supply		Electrical Transmission Lines from Existing Hydro Plants		Pico-Hydro Plants		Photovoltaic Panels on Individual Homes		Combined Irrigation Canal/Pico-Hydro System	
Criteria	Weight	Score	Score x Weight	Score	Score x Weight	Score	Score x Weight	Score	Score x Weight	Score	Score x Weight	Score	Score x Weight	Score	Score x Weight	Score	Score x Weight
Cost effectiveness	3	3	9	2	6	1	3	1	3	1	3	2	6	2	6	3	9
Social acceptability	5	2	10	3	15	1	5	2	10	2	10	2	10	2	10	3	15
Operations & maintenance feasibility	4	2	8	2	8	1	4	2	8	2	8	2	8	1	4	2	8
Environmental sustainability	5	3	15	1	5	3	15	2	10	3	15	3	15	3	15	2	10
Community participation	4	1	4	3	12	2	8	2	8	3	12	3	12	2	8	3	12
Impact on community health	4	1	4	2	8	2	8	1	4	1	4	2	8	1	4	2	8
Economic impact	3	1	3	3	9	2	6	1	3	2	6	2	6	2	6	3	9
Number of people impacted	4	2	8	2	8	2	8	2	8	3	12	2	8	3	12	3	12
Total			**61**		**71**		**57**		**54**		**70**		**73**		**65**		**83**

Project Hypothesis

- **Anticipated outcome** - improve household livelihood security through increased income opportunities and increased food security.
- **Problem being addressed** - low crop yield due to lack of water and energy production.
- **Critical causes to the problem** being addressed:
  - Energy: lack of technical expertise, inability to transfer energy to all wards, lack of energy infrastructure, lack of technical education, etc.
  - Water and crop yield: lack of agricultural knowledge, not enough water, poor distribution system, lack of business knowledge, damaged water infrastructure, lack of maintenance, lack of education, etc.
- **Relationships between the problem's causes and effects** - see problem tree
- **Effects and impacts of possible interventions** - see solution tree
- **Rating of the various interventions** - see MCUA matrix
- **Assumptions and pre-conditions** necessary to support the project hypothesis – see logframe

What	• What needs to be accomplished and in what order of priorities? • What represents success and impact? • What external and internal factors in the community could jeopardize success? • What are the short and long term benefits to the community? • What other institutions/agencies inside and outside in the community need to be involved? • What strategies will be used in addressing conflict and disagreement between parties? • What are the strengths and weaknesses of the partners?
Who	• Who are the partners and stakeholders? • Who will manage the project? • Who will be responsible for project strategy, operations and management?
When	• When would be an appropriate time to carry out the project? • When will the various project activities take place and their duration?
Where	• Where will activities take place? • Where are the needed resources located? • Where is the manpower?
Why	• Why are we conducting the various tasks? • Why are we involving this partner or group? • Why is it imporant to have and meet deadlines?
How	• How will the project be funded? • How will the project be managed? • How will any disagreement with and within the community be handled?

Action Feasibility matrix

Responsible actors	What contributions should they make?	What benefits will they get in the short run?	What should they do the ensure a long-standing 'solution'?	What benefits will the solution bring to them in the long run?
Interest group	Labor for construction, startup investment, full participation in sustainable agriculture	Increased crop yields empowerment of farming community	Maintain program and monitor & evaluate components for optimization, continued fund development, identify community member to perform maintenance	Increased sustained crop yields, increased cash crops, improved environment leading to higher food security and better health
Community at large	Support of new farming system funds, input from their perspective, conduct PAR	More food and greater economic base for community	Assistance with monetary support labor needs where necessary, basic knowledge/education of agricultural practice	Same as above
Local government agency (VDC)	Initial funding & technical support for design and maintenance, training support	Less dependency from community, community support and partnership	Continued support and regular monitoring & evaluation, some funding, continued technical assistance, follow-up	Community independence, increased ability to collect donations for other projects due to increased cash crop yields
NGO partner (NCDC)	Support & initial funding, training and support for design and maintenance, training support	Same as above	Same as above	Community capacity for other projects increased